

C R A D A facts

DEPARTMENT OF ENERGY
OFFICE OF FOSSIL ENERGY

GAS STREAM cleanup
PROJECT

HOT GAS DESULFURIZATION PDU PROJECT

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Capabilities

The process development unit (PDU) being constructed at FETC will fill the strategic role of bridging the gap between past/current small-scale testing and future large-scale demonstrations. With the capability for both fluid-bed and transport reactor contacting, the project will provide a site for testing/proving hot gas desulfurization (HGD) process configurations and demonstrating sorbent suitability. Process conditions will be representative of anticipated commercial applications in terms of temperatures, pressures, compositions, velocities, and sorbent cycling.

The project utilizes a coupled configuration with continuous circulation of a desulfurization sorbent between the absorption (fuel gas) and regeneration (air) sides of the process. Specially fabricated high-temperature slide valves in the circulation standpipes regulate the flow (circulation) of sorbent between the absorber and regenerator. Inert gases (steam and/or nitrogen) are used to fluidize the sorbent in the standpipes above the valves and to prevent fuel gas and air intermixing. Removable spool pieces and piping along with other vessel design features (such as submerged/freeboard risers and underflow/overflow standpipes) have been incorporated to expand potential testing capabilities. Since both the absorber and regenerator sides have fluid-bed and transport reactor capabilities, four principle configurational modes of operation are possible. Sorbent is circulated by reactant gases (i.e., fuel gas and air) in transport reactor modes and inert gases in fluidized-bed modes.

Opportunities

- Advance/leverage reactor system R&D
 - Protect/gain intellectual property
 - Eventual retrofit to applications other than HGD
- Share process technology development
 - Test planning
 - Training and observation of operations
 - Data reduction and analysis
- Qualify sorbent for commercial-scale demonstrations

HOT GAS DESULFURIZATION PDU PROJECT

Key Parameters

Absorption temperature	1,000 - 1,200 °F design
Regeneration temperature	1,100 - 1,400 °F design
Operating pressure	400 psia maximum
H ₂ S concentration	0.5 - 1 vol% typical
Sorbent circulation rate	2,000 - 5,000 lb/hr typical
Sorbent inventory	1,000 - 2,000 lb typical
Sorbent cycles per day	50 - 100 typical
Sorbent size	50 - 300 µm typical
Fuel gas flow rate	60,000 - 120,000 scf/h typical

Absorber

Fluid bed: 18 in. i.d. x 10-ft bed
Transport: 5.2 in. i.d. x 50-ft length

Regenerator

Fluid bed: 10 in. i.d. x 12-ft bed
Transport: 1.7 in. i.d. x 50-ft length

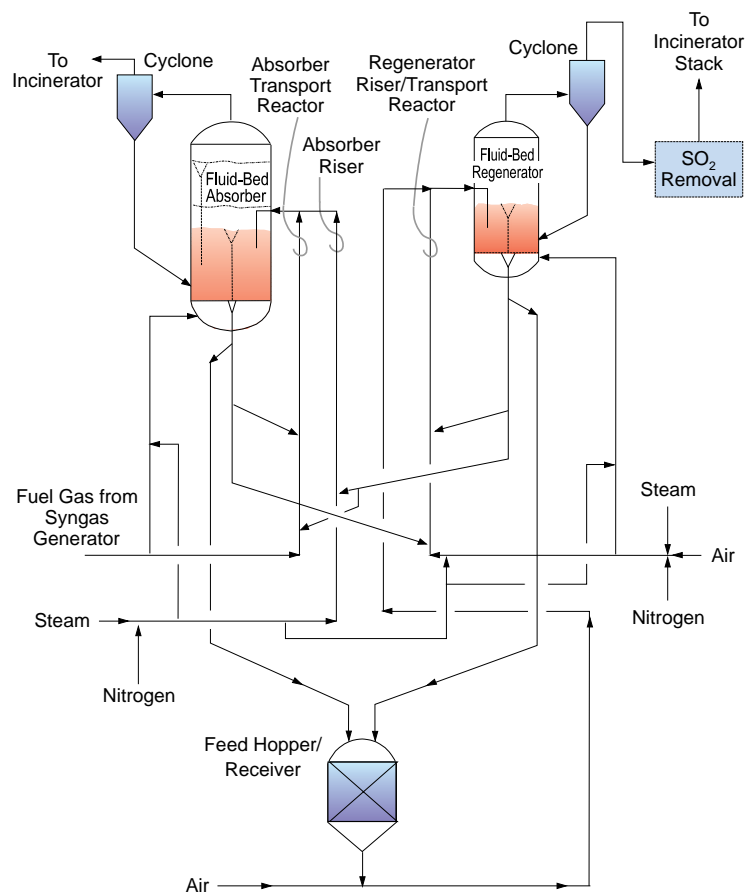
Typical Gas Velocity

Fluid bed: 1-3 ft/s
Transport: 15-20 ft/s

(i.d. = inside diameter)

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PDU Flow Diagram



Note: Only major interconnections shown

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The PDU at FETC